

Claims

What is claimed is:

1. A method for distinguishing between two different materials comprising the steps of:
 - a. directing radiation of two different wavelengths at an inspection site, radiation of one of the wavelengths being more strongly absorbed by one material relative to its absorption by the other material;
 - b. measuring the intensity of reflected radiation resulting from the radiation directed at the inspection site; and
 - c. determining which of the two materials is present at the inspection site based on the intensity of the reflected radiation resulting from directed radiation of one of the wavelengths relative to the intensity of the reflected radiation resulting from directed radiation of the other wavelength.
2. The method according to claim 1 wherein step (c) comprises comparing the intensity of the reflected radiation resulting from directed radiation of one of the wavelengths to a first absorption reference value to generate a first difference value, comparing the intensity of the reflected radiation resulting from directed radiation of the other wavelength to a second absorption reference value to generate a second difference value, and comparing the first and second difference values to determine a comparison value, a comparison value in excess of a preselected number being indicative of the presence of one of the materials at the inspection site.
3. The method according to claim 1 wherein step (a) comprises activating a radiation source to generate the radiation of the two different wavelengths and alternately positioning a first band-pass filter that passes radiation of one of the wavelengths and a second band-pass filter that passes radiation of the other wavelength between the radiation source and the inspection site or alternatively between the inspection site and a detector of the reflected radiation.
4. The method according to claim 1 wherein step (a) comprises activating

a first coherent radiation source to generate radiation of one of the wavelengths and activating a second coherent radiation source to generate radiation of the other wavelength.

5. The method according to claim 4 wherein the first and second coherent radiation sources are alternately activated to alternately direct radiation each of the two different wavelengths at the inspection site.

6. The method according to claim 1 wherein step (a) includes activating a quantum cascade laser to generate the radiation of two different wavelengths.

7. The method according to claim 1 wherein the radiation of the two wavelengths is in the infrared region.

8. The method according to claim 7 wherein the radiation of the two wavelengths is in the mid-infrared region.

9. The method according to claim 8 wherein the radiation of one of the wavelengths has a wavenumber of approximately 1750cm^{-1} .

10. A method for selectively removing one of two materials from an inspection site comprising the steps of determining which of the two materials is present at the inspection site according to the method of claim 1 and selectively removing one of the materials from the inspection site responsive to the determination.

11. A method for determining whether a substance is present on a base material at an inspection site comprising the steps of:

- a. directing light of a first wavelength at the inspection site;
- b. determining a first inspection site absorption value corresponding to absorption of the light of the first wavelength directed at the inspection site;
- c. calculating a first difference value by comparing the first inspection site absorption value to a first absorption reference value;
- d. directing light of a second wavelength at the inspection site;
- e. determining a second inspection site absorption value corresponding to absorption of the light of the second

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- f. wavelength directed at the inspection site;
- f. calculating a second difference value by comparing the second inspection site absorption value to a second absorption reference value; and
- g. generating an output signal indicating whether the substance is present at the inspection site based on the difference between the first difference value and the second difference value.

12. An apparatus for distinguishing between two different materials

comprising:

- a. a radiation module for generating radiation of two different wavelengths and directing the radiation to an inspection site;
- b. a detector module for receiving radiation reflected from the inspection site and generating a corresponding reflection signal; and
- c. a control module for receiving the reflection signal, determining which of the two materials is present at the inspection site based on the intensity of reflected radiation resulting from directed radiation of one of the wavelengths relative to the intensity of reflected radiation resulting from directed radiation of the other wavelength, and generating an output signal indicating which of the two materials is present at the inspection site.

13. The apparatus according to claim 12 wherein the radiation module comprises a first coherent radiation source that generates radiation of one of the wavelengths and a second coherent radiation source that generates radiation of the other wavelength.

14. The apparatus according to claim 13 wherein the control module is coupled to the radiation module and controls the radiation module to alternately activate the first and second coherent radiation sources.

15. The apparatus according to claim 12 wherein the radiation module comprises a quantum cascade laser.

16. The apparatus according to claim 12 wherein the radiation module comprises a non-coherent radiation source, a first band-pass filter that passes radiation of one of the wavelengths, a second band-pass filter that passes radiation of the other wavelength, and a pulse generator for alternately passing the first and second band-pass filters between the non-coherent radiation source and the inspection site.

17. The apparatus according to claim 12 further comprising a first optical transmission medium for directing radiation from the radiation module to the inspection site and a second optical transmission medium for directing the reflected radiation to the detector module.

18. A device for selectively removing one of two different materials from an inspection site, the apparatus comprising an apparatus according to claim 12 for determining which of the two materials is present at the inspection site and an removal apparatus for selectively removing said one of the materials from the inspection site responsive to the output signal.

19. The method according to claim 12 wherein the radiation of the two different wavelengths is in the infrared region.

20. The method according to claim 19 wherein the radiation of the two different wavelengths is in the mid-infrared region.

21. The method according to claim 12 wherein the radiation of one of the wavelengths has a wavenumber of approximately 1750cm^{-1} .